FLIGHT

The AIRCRAFT ENGINEER & AIRSHIPS

First Aero Weekly in the World
Founder and Editor: STANLEY SPOONER
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DIARY OF FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in the following list:

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Dec. 1	Lecture, "The Present State of Airship Development," by Major G. H. Scott, C.B.E., A.F.C., before R.Ae.S.
Dec. 15	Lecture, "Development of the Fighting Aeroplane," by Capt. F. M. Green, before R.Ae.S.
1922.	
Jan. 5	Lecture, "Specialised Aircraft," by Wing-Com. W. D. Beatty, before R.Ae.S.
Jan. 19	Lecture, "Aeroplane Installation," by Brig.-Gen. R. K. Bagnall-Wild, before R.Ae.S.
Feb. 2	Lecture, "Radiological Research," by Dr. V. E. Pullin, before R.Ae.S.
Feb. 16	Lecture, "Methods of Instruction in Aeroplane Flying," by Sq.-Leader Portal, before R.Ae.S.
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Mar. 30	Lecture, "The Design of a Commercial Aeroplane," by Capt. de Havilland, before R.Ae.S.
July 6–20	French Gliding Competition

EDITORIAL COMMENT

IN 1923 there will be held at Seville a great Spanish-American exhibition. Interesting, no doubt, in itself but of capital importance to us by reason of certain facts in connection with the enterprise. As we know, before the War the Germans were at considerable pains to cultivate the trade of Latin America, and we also know well how far they had succeeded in their campaign for creating in South America the principal market for their export trade. Naturally, the War called a halt to their activities, and their methods of making war completely estranged all the sympathies of the Spanish-American peoples. But business is business, and as we ourselves have discovered since the end of the War, it is impossible for any country or countries to practise a policy of commercial isolation. We must trade between nation and nation, whatever feelings we may have towards the people of this or that country.

Airship Lines of the Near Future

Now, in connection with this exhibition—or, rather, because of the opportunity it gives of launching the enterprise under the most auspicious circumstances—the Germans have planned to open an airship service between Spain and South America. The Zeppelin Co. is to operate the service, which will start from Seville, run down the West African coast as far as Bathurst, in the British colony of Gambia, and thence across the narrowest part of the Atlantic to Pernambuco, in Brazil, the overseas distance to be covered being about 2,200 miles. All the plans are apparently complete, and it is understood that the building of the necessary ships will be commenced in Spain in the New Year. The only doubtful element seems to be that of the possibility of constructing sheds, which would have to be of the revolving type, in South America in sufficient time. This difficulty, however, can easily be overcome by the use of mooring-masts, and this way out will in all probability be adopted. Thus we shall see in being within the next eighteen months an airship service across the Atlantic, being operated under German auspices and largely with German capital. Nor is there doubt about the commercial possibilities of such a service. It will save, it is estimated, from nine to fourteen days in the time

required to reach South America from London, according to whether the traveller elects to proceed to Seville by air or by the more orthodox methods of travel. That will of a certainty ensure that a good deal of passenger traffic will be available, as soon as the service has been demonstrated to be safe and reliable. As to that we have no doubts whatever. Then, the mails from Spain to the Argentine alone average from seven to eight tons weekly and, assuming that the Spanish postal authorities have more imagination than our own, which is scarcely to be doubted, the revenue accruing from the conveyance of mails ought to be very substantial.

The news that this Spanish-German line is to be inaugurated seems to have given a fillip to French airship enterprise. The aeronautical section of the Council of National Defence has approved the programme of the Air Ministry for the construction of airships. This provides for airship centres at Paris (Orly), Marseilles, Algiers, Tunis, Casablanca, and Dakar in Senegal. The aerodrome at Orly will constitute the main base, and the installations necessary for constructive work on an extensive scale, as provided for in former Budgets, are already practically complete. These include large workshops, a gasometer, control and Customs-houses, and two Zeppelin sheds nearly 1,000 feet long. The air ports at Marseilles, Algiers, and Casablanca are to be completed by 1923. The route over which it is intended to operate the first services will eventually serve as a basis for a Transatlantic service to South America, with Pernambuco as its terminus.

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What are We Doing?

It is almost idle to ask what we are doing while all these activities are in course of preparation. We are doing much worse than nothing at all, since we are allowing to slip away all the accumulated knowledge and experience we acquired during the War at a cost of £40,000,000. We are scrapping material, costly material, which could be turned to good account in gaining further experience of the commercial operation of airship services overseas. Worse than all, we are allowing the keen, experienced *personnel* of our airships service to drift back to other occupations, disgruntled and discouraged by the treatment it has received at the hands of a Government which has not known its own mind for ten minutes together.

As *The Times* aptly said a few days ago, in discussing this same question of airship services, today the air policy of the Government appears to have only two objects in view—the scrapping of both airships and airship enterprise, and the strengthening of the military air force at the expense of civil and commercial aviation, because these have not as yet proved to be paying concerns. There can be no escaping the conclusion that either this policy is extremely short-sighted, or that France and Germany, and now Spain, are making a capital mistake in backing airship enterprise in the way they are preparing to do. France, as we have insistently urged in these pages, is backing commercial aviation almost literally for all she is worth and believes in its future wholeheartedly. Our own Government seems to be completely at variance with this ideal. Obviously, both cannot be right. If France is right—as we are convinced is the case—then we must be wrong, in which case we are losing valuable time which in all probability we shall never be able to regain. At the end of the War we had attained a hardly-won supremacy in the air. To claim that we still possess that supremacy would be to assert an obvious falsehood. The question which has to be answered is whether it is worth while or not to endeavour to regain it? We, and others who think with us, are most absolutely convinced that it is.

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An Aerial Postage Stamp?

The Postmaster-General, in reply to a question by Mr. Raper, recently made the following reply, which is well worth quoting here in full:—

"I am considering how far wider publicity can be given to existing air mail services with a view to increasing public interest in the traffic; but, as at present advised, I do not think that the issue of a special postage stamp would have the effect desired by the hon. member. A blue air mail label to be affixed to air mail correspondence is already issued on application at all head and branch post offices. Letters can be posted for the air mail in any letter-box, and at any time; and it would obviously hamper the free use of the service if only air mail stamps could be used."

Considering the common agreement that seems to exist to the effect that such special stamps as those suggested would be a valuable aid to the development of the air postal services, we are quite at a loss to understand the point of view of the Postmaster-General. It would be interesting, and a great deal more convincing, if he had told the House why he thinks the effect would be otherwise than everybody but the official of the Post Office thinks. He might also have thought that, even if such special air post stamps were issued, it would be possible to arrange that letters which bore the ordinary postage stamps to the proper value and which were clearly marked for transmission by air post could still be sent that way. It is a wonder the official mind does not boggle at a 1½*d.* and a ½*d.* stamp being placed on a letter to make up 2*d.*! The one objection would be as logical as the other. It seemed to come rather as a shock to the Postmaster-General to be told that the French Government had already issued special aerial postage stamps, and remarked that he would consider that!

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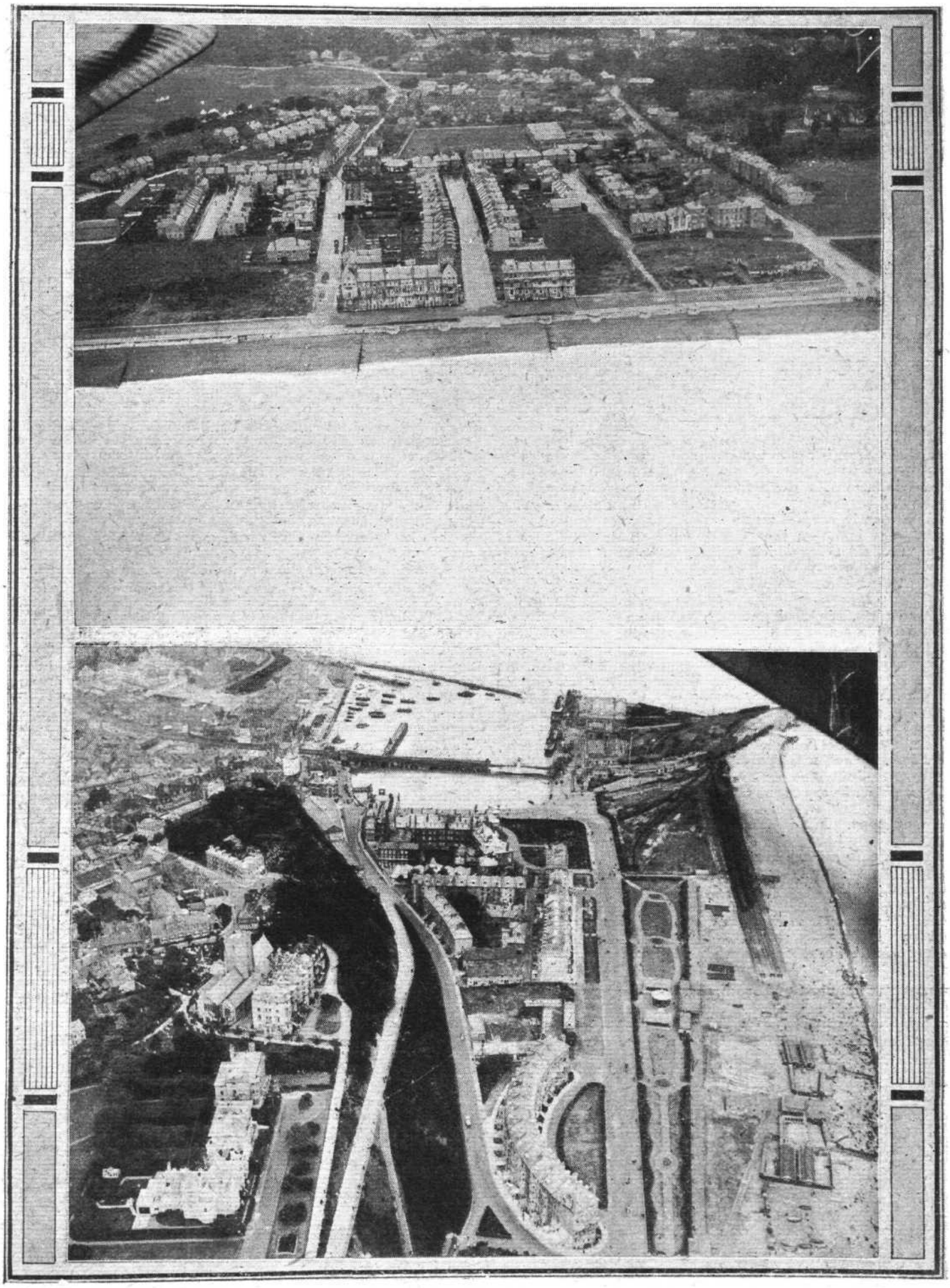
Surveying by Aeroplane

We have had occasion to record several instances in which aircraft have been used for the survey of proposed roads and railways in undeveloped country, but something quite out of the ordinary has been inaugurated by the Ministry of Transport, in the shape of an aerial survey of the route of the proposed new road between London and Southend. As the Ministry points out, it is purely an experiment, but it is hoped to obtain in thirty minutes a series of photographs which, laid side by side, will give a complete bird's-eye view of the proposed route. If the ordinary methods of ground survey were adopted the work would take two or three weeks to complete.

We need hardly say that we shall await the results of this really interesting experiment with a good deal of pleasurable anticipation, because we believe in its success and that it will open up a great field of aerial activity which has hitherto been unexploited save in countries of great distances and which are sparsely populated. If it does give the results anticipated, aerial survey work will receive a wonderful impetus, since it will have been demonstrated that there are practically no limits to the uses to which aircraft can be put in such connections.



LONDON-PARIS FROM THE AIR, AS SEEN FROM A HANDLEY PAGE MACHINE:

No. 16.—*At top*, Hythe; *below*, Folkestone Harbour and Sands.

THE · PARIS · AERO · SHOW · 1921

BY THE TECHNICAL EDITOR

(*Continued from page 780.*)

ÉTABLISSEMENTS CAUDRON

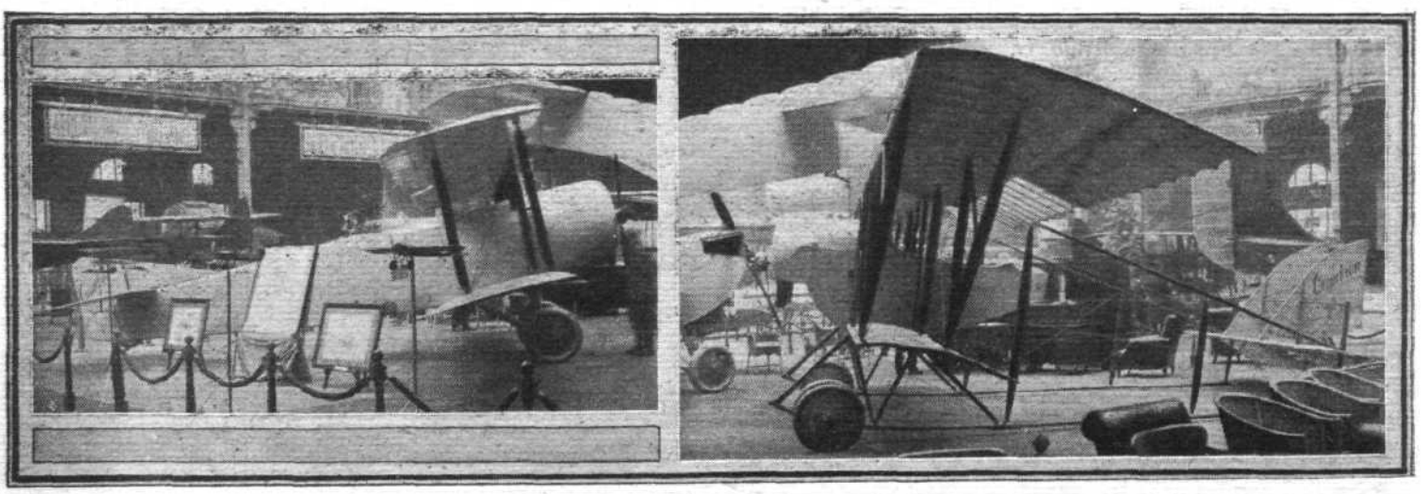
52 to 72, Rue Guynemer, Issy-les-Moulineaux

ONE of the first, if not actually the first, of French designer-constructors to utilise the three-engine principle was M. Réné Caudron. At the Paris Salon of 1919 a very large machine incorporating this principle was exhibited. That machine was in several respects scarcely up to modern standards. For instance, the wing bracing was in the form of piano wire, a feature which came in for a good deal of criticism. Perhaps one would have been inclined to judge it less harshly had one been informed that, although its cabin was got up for "show," the machine was, from the practical point of view, intended not so much as a finished product as to provide a sort of flying laboratory, in which thorough tests could be carried out on the advantages or otherwise of three engines. Problems such as manœuvrability with one wing engine out of action, and the ability to fly on two engines only, were among the problems attacked. For reasons of economy, everything was kept as simple as possible, among others the piano wire wing bracing. We understand, that some interesting results were obtained, and that, in a measure, the three-engined machine exhibited this year is the direct and practical outcome of these experiments.

A number of very great improvements have been effected in the new machine, which is considerably smaller than was the 1919 type. For instance, the wing bracing is the now generally adopted streamline wire, and the detail design generally conforms more to modern ideas. The three-engined feature has been retained, so presumably the tests on the "C. 25," indicated certain advantages. Apart from the question of reliabllity, there does not appear to be any reason to suppose that three engines offer any great improvement over two. The only exception is, perhaps, that of turning moment in the case of one wing engine stopping. It will easily be seen that, for a given power and with the wing engines spaced the same distance out from the centre line, the turning moment will be smaller by an amount corresponding to the difference in the size of the units into which the power is divided. Whether this advantage is sufficiently large to be of practical value is, perhaps, open to discussion. In any case, the effect of having three engines is merely to reduce the turning, it does not prevent it entirely.

From the aerodynamical point of view, it is doubtful if there is any gain to be derived from using three engines. We believe that in the case of the three-engined Farman Goliath it was found that it made but little difference to the speed of the machine whether the central engine was on or off. This is not so surprising as it may appear at first sight. To begin with, fitting the central engine adds considerably to the weight of the machine. The slip stream from the propeller increases the *fuselage* resistance very materially, and, what with one thing and another, the gain in speed is inconsiderable. There remains then only the question of reliability as a reason for three engines, and carrying an extra engine is a rather heavy price to pay for reliability. The time should not be far distant when aero engines are so reliable as to render such drastic measures superfluous.

As regards the Caudron "C. 61," the machine shows much better detail construction than did the machine of 1919. Its general lines are also more pleasing, and altogether the machine impresses one as being a great improvement on the "C. 25." The *fuselage* is an ordinary girder type, fabric covered, and projects a considerable distance out in front. One Hispano engine is placed in the nose, and just behind it is an open cockpit for the pilot and engineer. The view obtained from the pilot's cockpit is extremely good, owing to



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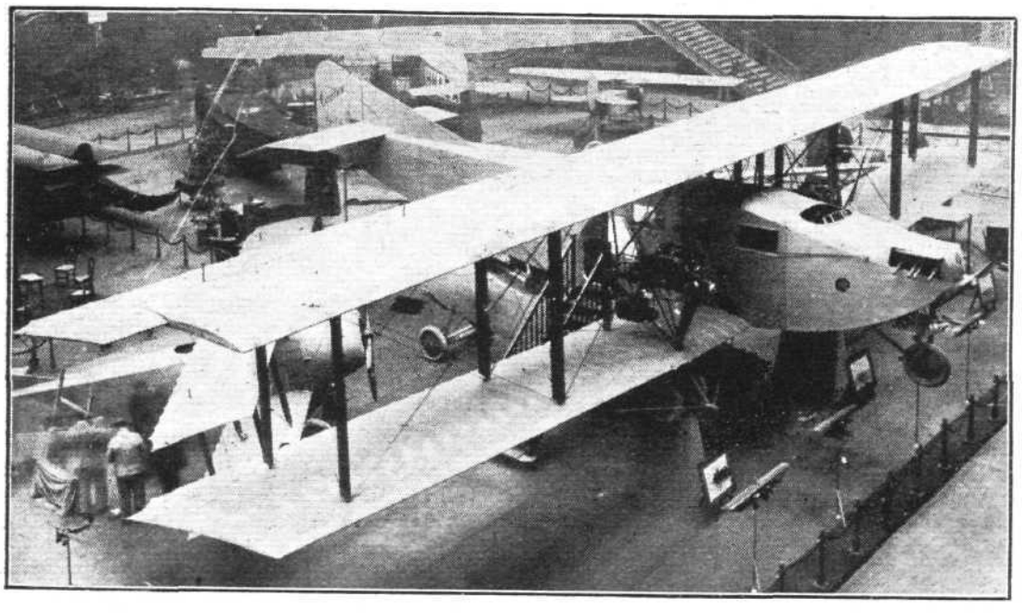
TWO CAUDRONS AT THE PARIS SHOW: On the left is the type 60 used by Poirée, and on the right, the old-timer used by Durafour for landing on Mont Blanc.

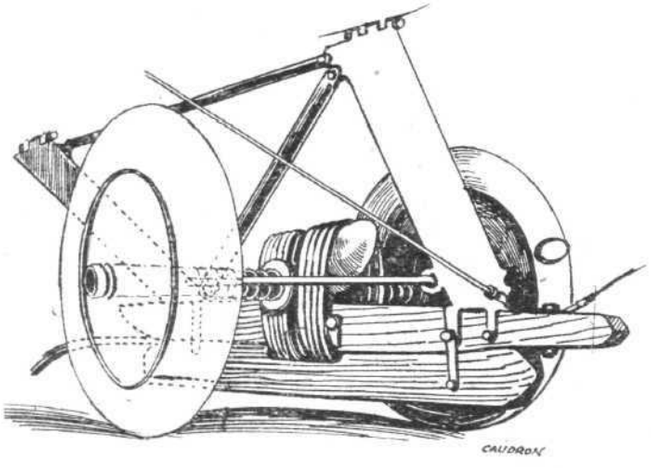
the cockpit being well forward, and to the comparative small width of the front portion of the *fuselage*.

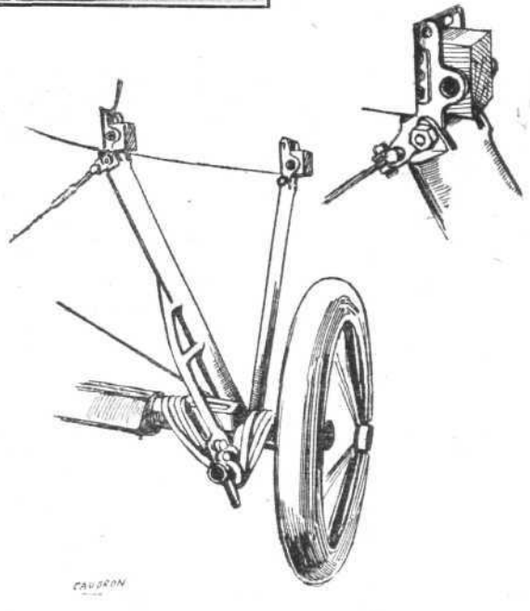
The cabin extends from the pilot's cockpit to some distance aft of the trailing edge of the non-staggered wings. Entrance to it is effected through two doors, one on each side. The depth of the cabin is sufficient to give room for standing upright, but the seats, instead of being placed on the floor itself, are mounted on the top of two raised platforms running one along each side of the cabin. The reason for this arrangement, which is not obvious at first sight, is that the tanks are contained in the *fuselage* under the platforms on which the seats are mounted. This is, perhaps, the most objectionable feature of the whole machine. At a time like the present, when every endeavour is being made to guard against fire on board, it does appear a direct challenge to fate to place the petrol tanks immediately under the seats of the passengers. Petrol vapours have a nasty habit of hanging about in the vicinity of tanks and pipes, and it is difficult to see how they could be prevented from escaping and mixing with the air in the cabin. Quite apart from any matches being struck by a passenger, the knocking of a boot against a screw or nail might conceivably be the cause of a spark, in which case an accident might easily occur which would seriously injure the cause which we all have at heart. For the sake of aviation in general, we would urge the Caudron Company to change the position of the tanks before the machine is flown. On the Spads, placing the tanks on the top plane appears to have proved satisfactory, and although this does not increase the beauty of a machine, it does undoubtedly add greatly to the safety from fire.

The wing engines are placed on the side of the inner wing struts, and are further supported by tubes sloping out from the base of the struts to the outer engine bearers. The engines are not enclosed in any way, but possibly it may be the intention to add a cowling later.



The three-engined Caudron has the pilot's seat in front of the cabin.





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TWO CAUDRON UNDERCARRIAGES: On the left is shown one of the skid undercarriages of the "C. 61." Note the arrangement for giving equal tension in the various rubber cords, and the skid below, which protects the rubber against wear. On the right is shown one side of the quickly-detachable undercarriage of the "C. 59" and "C. 60."

A four-wheeled undercarriage, consisting of two units of two wheels, is fitted This is of the short skid type, and one of our sketches shows how the rubber cords are wound around the skids and axle cross-piece to give even tension in the rubbers. A wood shoe under the rubbers prevents wear and tear against the ground. A fifth wheel is added to the undercarriage, in the form of a small wheel under the nose engine. One is somewhat doubtful as to the fate of this wheel, or at any rate its tyre, when the machine is swung around on the ground.

As the passenger accommodation is for six only, and the total power is approximately 450 h.p., the power expenditure per passenger is about 75 h.p., which appears somewhat high.

It may be, however, that the designers are counting on running the engines at half power normally, so as to prolong their life, in which case this should be taken into account when trying to assess the utility of the machine. A good margin of power is the best possible safeguard against accident, and nothing is more dangerous than an under-powered machine. However, in the case of the Caudron the excess of power appears to be unnecessarily great.

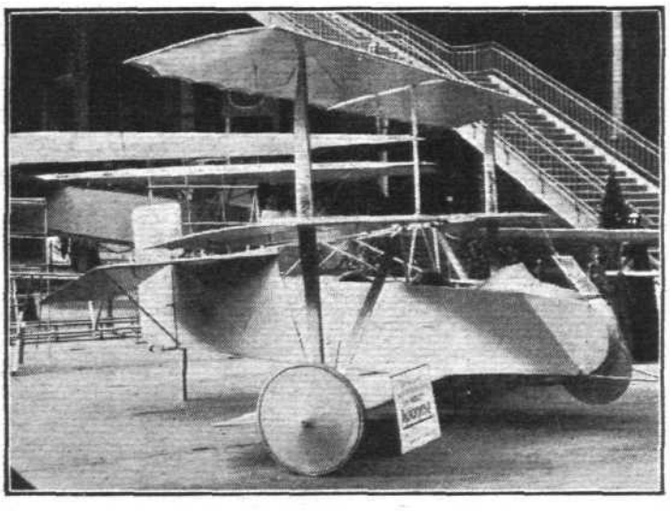
Following are the main characteristics of the Caudron "C. 61.": Span, 79 ft. 3 ins.; length o.a., 46 ft.; height, 13 ft. 2 ins.; wing area, 1,120 sq. ft.; weight empty, 4,850 lbs.; petrol, 970 lbs.; useful load, 1,850; total weight, 7,670 lbs.; weight per sq. ft., 6·85 lbs.; weight per h.p., 17 lbs.; speed near ground, 100 m.p.h.; duration, four hours; range, 400 miles. The useful load includes 1 pilot and 1 engineer, 350 lbs., and six passengers with luggage, 1,500 lbs.

Two more complete machines are shown on the Caudron stand. One of these is the type "C. 60," on whith Poirée put up such a good performance for the Michelin Cup. This is a tractor biplane with rotary engine, and does not lay claim to any special novelty. It might be mentioned, however, that the undercarriage is so designed that it can be removed by undoing four bolts. During his flight, we believe, Poirée carried a spare undercarriage in the *fuselage*. The second machine is of the famous "G. 3," type, also with rotary engine. The only difference discernible between it and the pre-War model appears to be that the modern version is fitted with *ailerons*. It was, it may be remembered, on a machine of this type that M. Durafour alighted on and started from the summit of Mont Blanc.

ÉTABLISSEMENTS LOUIS CLÉMENT ET SANCHEZ-BESA

128, Rue de Silly, Boulogne-sur-Seine, and 2, Avenue de Bellevue, Sèvres (S.-et-O.)

THE name of Louis Clément, as well as that of the Sanchez-Besa firm, has for a number of years been associated with metal construction. At the 1919 Paris Show, L. Clément



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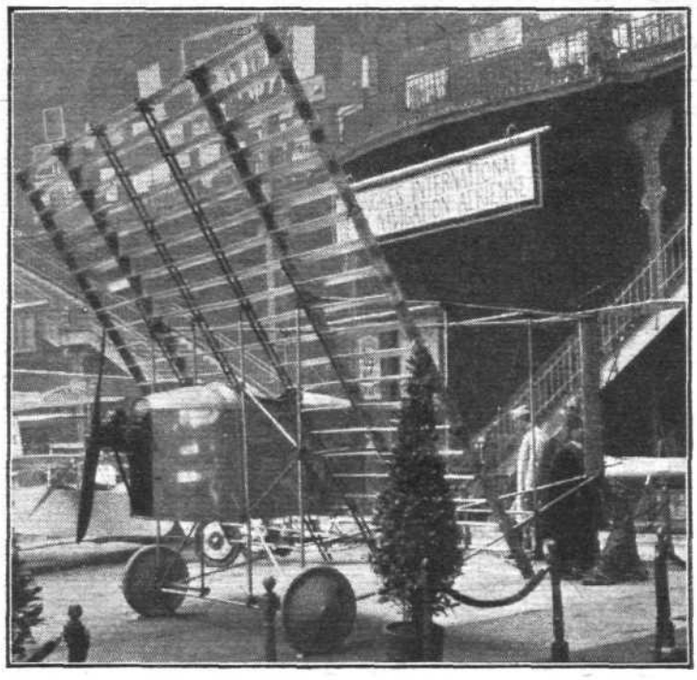
THE CLÉMENT TRIPLANE GLIDER: This machine was shown in 1919 as a power-driven machine.

exhibited a racing monplane, with metal wings of extraordinary design and construction, and a small triplane of no less unorthodox design, while in the shows gone by one has recollections of pusher biplanes somewhat of the ancient Voisin type, which variously bore the names Bathiat-Sanchez and Sanchez-Besa. This year, the name painted on the banner above this stand announces Clément and Sanchez-Besa. From both names, therefore, one expects unorthodox design and metal construction of some kind. Nor is one disappointed in this respect. Unorthodoxy and metal construction are both abundantly in evidence. It is a matter of some difficulty to decide which is Clément and which is Sanchez-Besa. But the little triplane, which is claimed to be a glider, is our old friend the power-driven triplane of 1919 *sans* engine, and the multiplane exhibited is announced to be Sanchez-Besa. Concerning the triplane little need be said, except that it does not impress one any more in this guise than it did in 1919 as an alleged aeroplane.

The Sanchez-Besa multiplane one might be inclined to dismiss as one of those freaks so dear to certain French



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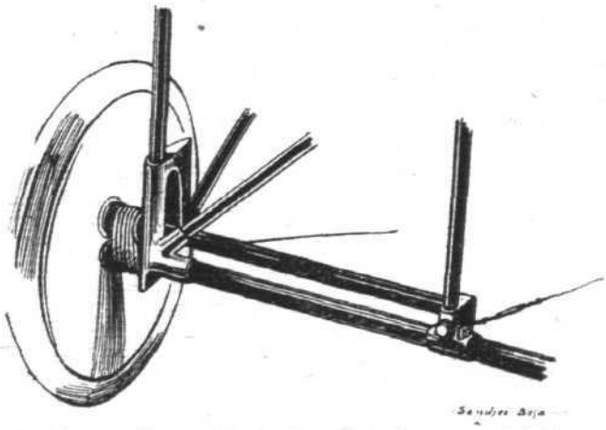
Three-quarter front view of the Sanchez-Besa multiplane, 40 h.p. (British) A.B.C. engine.

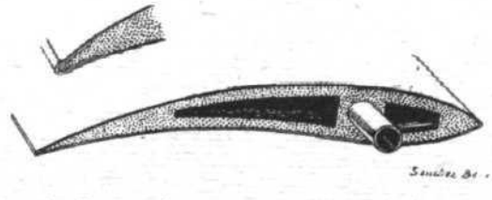
inventors, were it not for the fact that one gathers that it has been "studied" by M. A. Toussaint, Director of the *Institut Aérotechnique de Saint-Cyr*. It can hardly be imagined that, with such facilities for preliminary wind tunnel tests of a scale model, the expense of a full-size machine would have been incurred unless the experiments indicated some very good reason for its construction. Looked at in this light, the Sanchez-Besa multiplane appears to demand closer study, and we consequently proceed to seek for information.

The French description of the machine, is, we believe, an



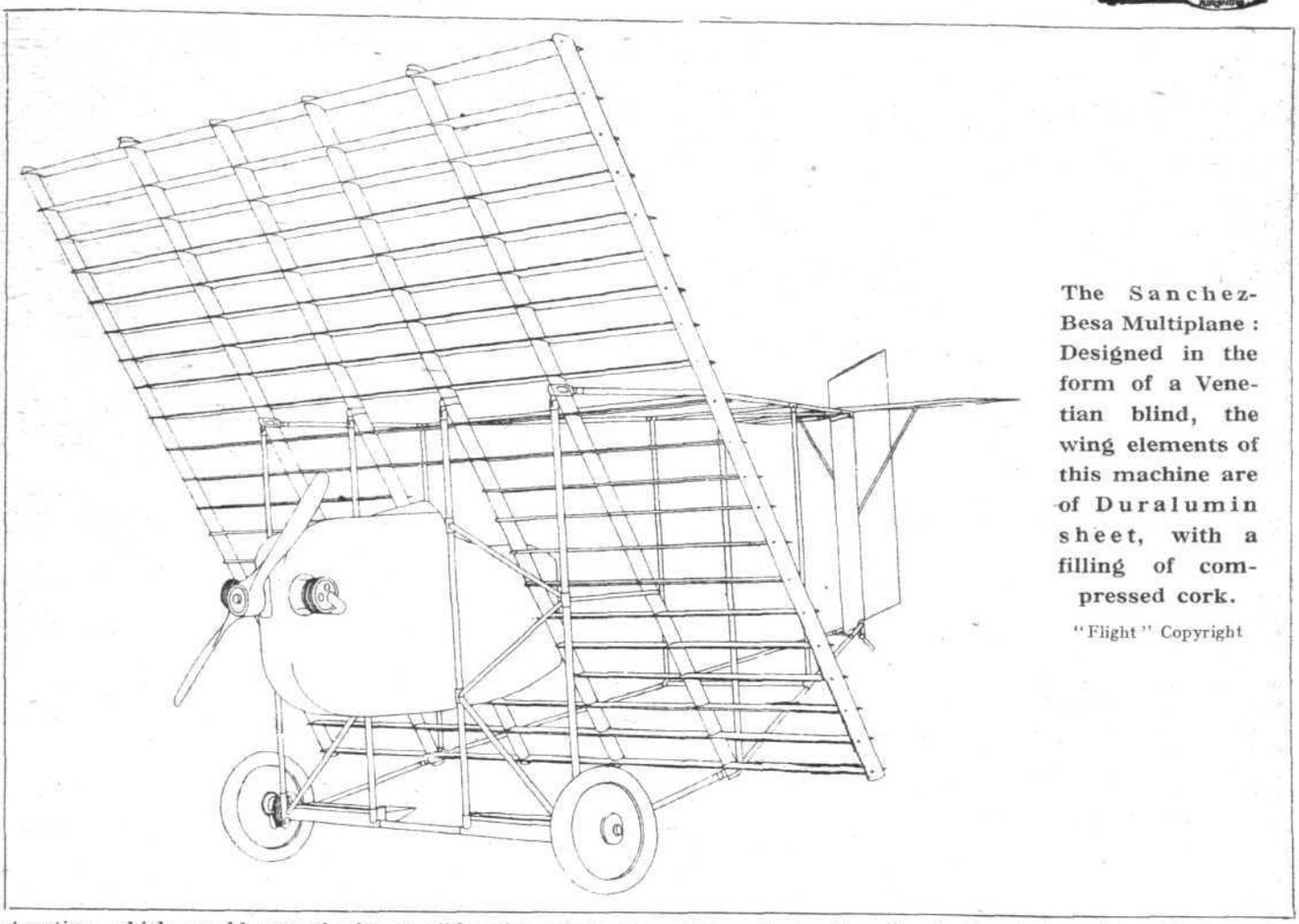
The undercarriage of the Sanchez-Besa multiplane is built up entirely of metal tubing.

"appareil de tourisme à persiennes canadiennes." The multiplane wings, which have a chord of about 6 ins. only, are arranged somewhat after the fashion of the slats of a Venetian blind, with its top leaning forward. The reasons which have led to the adoption of this design are various. To begin



The sketch shows the construction of the small wing elements.

with, such an arrangement results in a relatively small span, while still retaining a high aspect ratio for the individual aerofoils. Secondly, the problem of metal covering is much simplified, as the narrow aerofoils lend themselves to a con-



The Sanchez-Besa Multiplane: Designed in the form of a Venetian blind, the wing elements of this machine are of Duralumin sheet, with a filling of compressed cork.

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struction which would scarcely be possible with wings of ordinary dimensions. As shown by the accompanying sketch, the aerofoils are of composite construction, consisting of a packing or base of compressed cork, covered with aluminium sheet. The claims made for this construction are that individual aerofoils are very rigid, have a great moment of resistance, are fire proof, and are entirely free from vibration and resonance. We understand that during some inflammability tests it was found that, although the wing elements were liberally sprinkled with petrol which was set on fire, there was no indication of the aluminium melting or of the internal cork packing getting scorched. Whatever one may think of the machine as an aeroplane, it will be seen that the design has not been adopted simply for the sake of producing something unusual. It should also be pointed out that in this the first experimental machine no attempt has been made to reduce the design to the refinements of a finished product. If the multiplane arrangement proves satisfactory, its ultimate adoption to a cleaner general design will follow automatically.

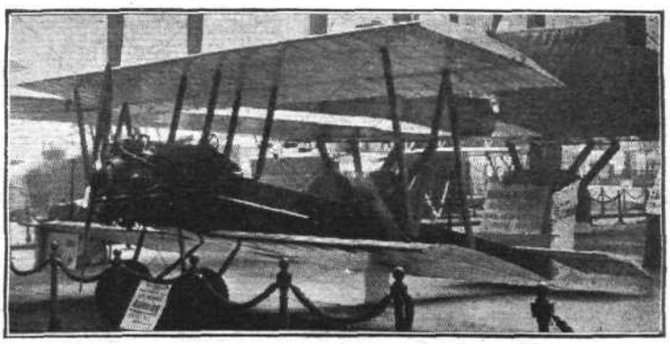
The aerofoils, of which there are 21, have one single tubular Duralumin spar each, and the small twisting moment caused by the travel of the centre of pressure is lessened by so fixing the elements of each aerofoil to the vertical struts that each of the five short pieces into which each wing is divided is supported at both ends in such a way as to prevent it from twisting. Certain of the outer elements are freely pivotted on their single tubular spars so as to be free to rotate. A vertical rod running down the front of the main strut is linked to cranks projecting forward from each wing element, and is connected up to the controls in such a way as to enable the pivotted elements on one side to be tilted in one direction, while those on the opposite side are turned in the opposite direction, thus acting as *ailerons*.

As regards the rest of the machine, there is little to say, as this is probably a temporary arrangement only, and will not necessarily be retained in later models. The *fuselage* is of the short "coracle" type used in the early Caudrons. In the nose is mounted a 40 h.p. British A.B.C. two-cylinder opposed air-cooled engine, driving a tractor airscrew. The tail is carried on open tail booms in the old-fashioned way. The front portions of the four tail booms serve as supports for the wings and give rigidity to the structure. An apparently extensive amount of wire bracing is indicated by a number of lugs on various parts of the machine, but at the time of our visit to the stand, but little of the wiring was in place.

The undercarriage is of a very simple type, and provides a very wide track, owing to the placing of the wheels on the lower front corners of the tail boom structure. The weight of the machine empty is about 200 kgs. (440 lbs.). The span is 4 m. 50 (14 ft. 9 ins.) and the wing area 12·5 sq. m. (134·5 sq. ft.). No particulars relating to performance are available, but it is understood that after the closing of the Salon the machine will be put through its tests, when we hope to be able to inform our readers of the results.

SOCIÉTÉ DES AVIONS H. AND M. FARMAN
167, Rue de Silly, Billancourt (Seine)

PURELY as regards size, the Farman stand is the most imposing in the Grand Palais. Three of the four machines shown are large machines, and one a very large one indeed, while the fourth is the diminutive Farman "Sport." From the point of view of novelty and interest, however, the stand scarcely keeps the promise which its magnitude makes. This is due partly to the fact that, except for the "Sport"—which is an old type in any case—the machines are all military types, about which no information appears to be available. A visit to the stand reveals only such items of information as may be gathered from walking about *under* the machines, as no facilities were available for a more detailed internal inspection. One of the machines shown is practically a standard "Goliath," with the exception that it is rigged up, apparently, for bombing. Also, instead of the usual enclosed



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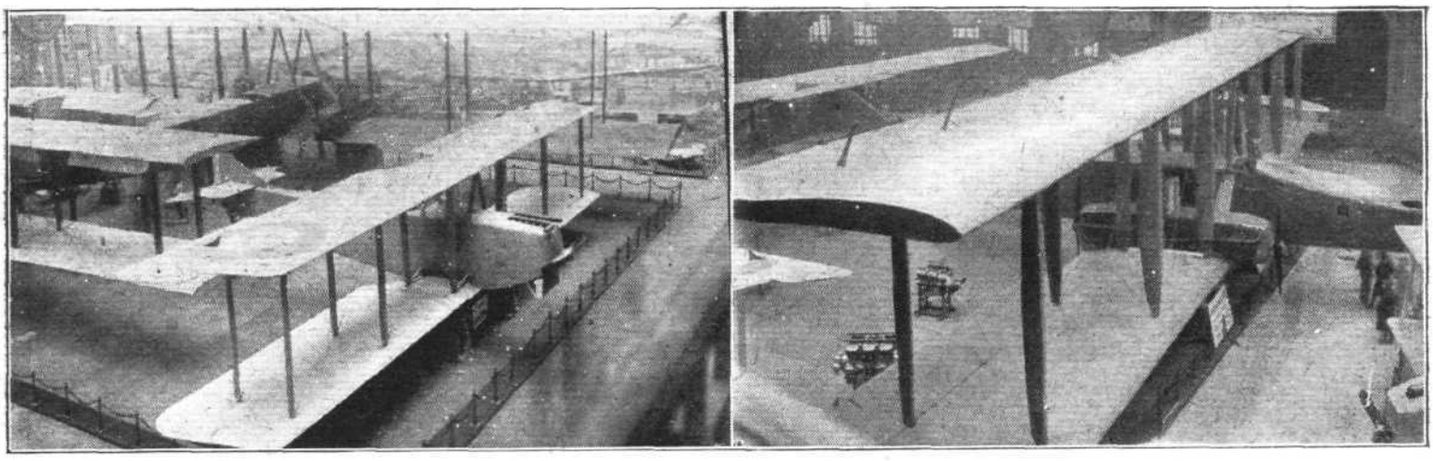
The Farman "Sport" is this year shown fitted with an Anzani engine.



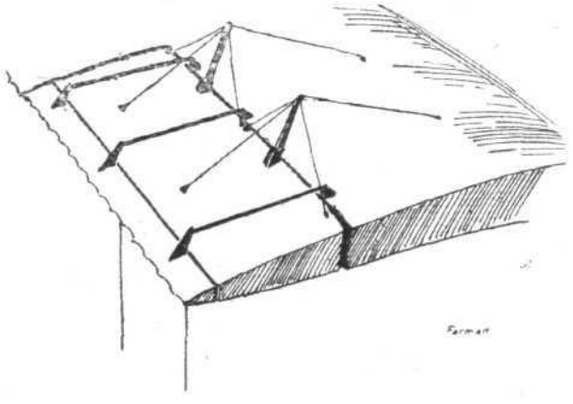
TWO FARMANS AT THE SHOW: On the left, the torpedo 'plane, and on the right the huge four-engined night bomber.

nose its *fuselage* has a gunner's cockpit in the extreme nose. The machine appeared fitted up with generators, lights, wireless, navigation instruments, drift indicators, etc.

The second military machine is a torpedo 'plane of sorts, with a single engine in the nose of a ply-wood *fuselage*. A tunnel is scooped out in the floor of the *fuselage*, and in this is suspended the torpedo. The machine is no prettier than other Farmans, and is very unlike our own torpedo 'planes, chiefly, perhaps, on account of the large wings. While our machines are mostly designed for work from a ship, the French are mainly for coast defence, and hence there is little or no similarity in the respective requirements.

Of most interest on the Farman stand is, perhaps, the large four-engined machine type "B.N.4" (night bomber). The machine is of enormous proportions, its span being 113 ft. 4 ins., and its weight 10½ tons. The four engines (Lorraine-Dietrich) are mounted, tandem fashion, on the wings. The *fuselage* projects far out in front, and under the nose are generators, searchlights, and other paraphernalia associated with night flying. In the floor of the *fuselage*, which is covered with ply-wood in front, while the rear is an ordinary girder type of construction, there is a scoop for a gun ring, somewhat after the fashion of the famous gun tunnel of the Gothas, and slightly further forward there is a trap door for bombs.

The wing bracing is in the form of solid tie rods, but instead of being threaded at their ends, the tie rods are looped through eyebolts, bent over and locked with a ferrule and (apparently) welding. The eye-bolts themselves screw into swivelling trunnions held in sheet-steel stirrups. The wings are designed to fold, and in order to facilitate access to the locking pins in the top front spars, the frout interplane struts are provided with a series of steps.

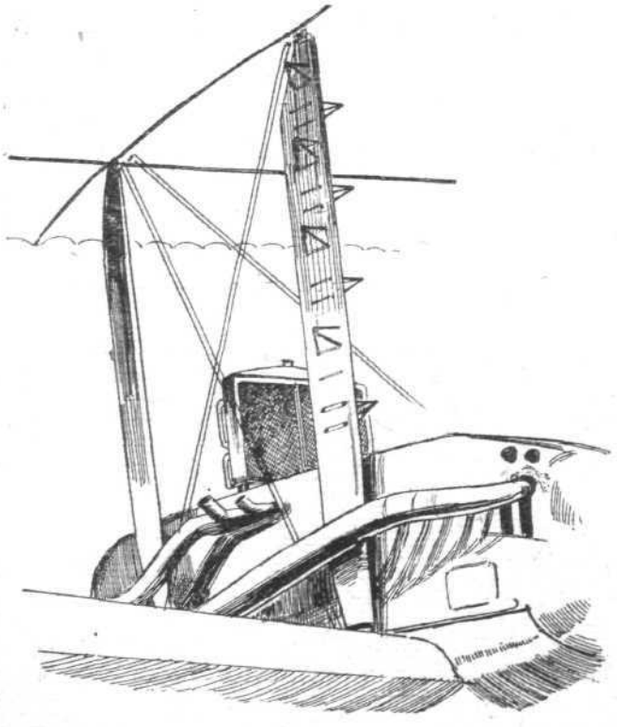


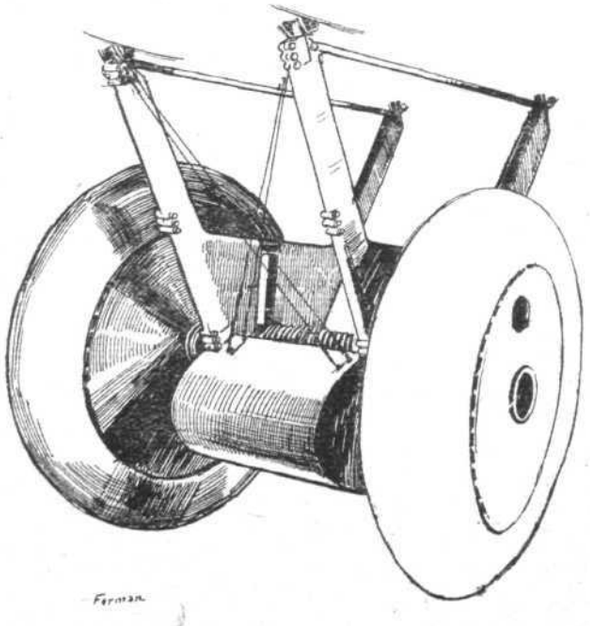
"Flight" Copyright

The unusual arrangement of the *aileron* balance on the four-engined Farman.

The Farman "Sport" remains the same as that of the 1919 Show, except that the little 60 Le Rhone rotary engine has been supplanted by a 60 h.p. Anzani radial.

(To be continued.)





SOME DETAILS OF THE FARMAN FOUR-ENGINED MACHINE: On the left, one of the engine *nacelles*. Note the steps which give access to the top plane fitting for folding the wings. On the right is shown one-half of the four-wheeled undercarriage.

LONDON TERMINAL AERODROME

Monday Evening, November 28.

THE dense fog which played havoc with land traffic this last week-end, had an adverse effect, naturally, on the regularity of the London-Paris air service. For two days, in fact, it was demoralised.

The 230-miles stretch over which the aeroplanes operate is particularly prone to fog, and, even when the British end is comparatively clear, fog may be reported either in the Channel or in Northern France. On both Friday and Saturday the fog persisted almost without any clearance at all at Croydon; and yet only a few miles away the weather was clear. The result was that only one machine got away from Croydon on Friday, and none at all on Saturday.

The outstanding event, however, was the performance put up by the "Goliaths" on both these days while *en route* from Paris to Croydon. These machines—one on each day—were the only ones which succeeded in completing their journeys, all the others which left Paris descending at Lympne. It is a striking tribute to the confidence of pilots in these big Goliath machines, and, incidentally, it reverses the old order of things. At one time if anybody got through at all it was a British pilot, but it is evident that they will have to look to their laurels now.

On Sunday pilots of aeroplanes stranded at Lympne made a determined effort, and machines came gliding into the aerodrome during the afternoon, though the weather was little if any better than on the previous two days.

Monday morning saw the end of the fog, which was "rolled up" by a southerly wind in less than half-an-hour.

Mr. Courtney Flies an "18" Again

ON Friday, owing to unforeseen circumstances, the Instone Air Line were again short of pilots; but Mr. Courtney, being on the spot, deputised on one of the D.H. 18's. He was the only pilot to leave the aerodrome, but was compelled by the weather to descend at Lympne; where, by some mysterious "juggling" of pilots, he was relieved of his machine and arrived back at Croydon in the Handley Page on Sunday afternoon.

Mr. Courtney has been approached by the Disposal Company to fly an Avro to Brussels, but, in common with other pilots, he does not consider the fee of £8, with no expenses, good enough. Pilots are prepared to fly D.H. 9's—or any machine of equivalent speed—to Brussels for this fee, as they can get back by the night boat; but an Avro takes longer on the journey, and, halts having to be made to replenish petrol tanks, the catching of the night-boat becomes a question of doubt—with the result that the fee is not considered worth while.

Captain Leverton, of K.L.M., is still at the aerodrome, not having started as yet on his tour of the European air-ports; while his staff is busy clearing up outstanding items from the summer's flying. I understand that the Amsterdam end of the service has not shut down completely, and that the route between Amsterdam and Paris is still open, while the K.L.M. are open to take winter "taxi" jobs.

Wireless Concert from the Air

CAPTAIN MUIR has now another "freak" job. A lady, having bought a Westland which she has had fitted with the latest in aerial wireless installations, Captain Muir is to fly this machine over to Amsterdam. Whereupon the lady—so it is reported—is going to sing into the wireless transmitter and treat the Dutch wireless operators to a concert from the air. All this should have happened last Saturday, but the weather was too bad, and the performance is, therefore, postponed until next week.

The Meteorological Office is experimenting with a new apparatus for ascertaining the height of fog. A balloon—or a number of small balloons to give the necessary lift—is attached to an instrument worked on the principle of the old weather-cock, in which the figure of a man or a woman came out of a little wooden hut according to whether the weather was to be fine or wet. The action of the moisture in the fog holds a small brass ring in place, but, when the instrument goes out of the top of the fog into dry air, the ring is released and slides down the string into the operator's hand, and the length of string let out when this happens gives the approximate height of the fog.

This information is of little use at present, but when flying above fog becomes practicable it will be of great value.

THE LONDON-CONTINENTAL SERVICES

FLIGHTS BETWEEN NOVEMBER 20 AND NOVEMBER 26, INCLUSIVE

Route‡	No. of flights*	No. of passengers	No. of flights carrying Mails	No. of flights carrying Goods	No. of journeys completed†	Average flying time	Fastest time made by	Type and (in brackets) Number of each type flying
						h. m.		
Croydon-Paris	18	34	7	13	12	3 19	Goliath F-GEAO (2h. 42m.)	B. (2), D.H.18 (1), G.(5), H.P. (3), Sp. (3), V. (1).
Paris-Croydon	20	48	4	17	14	2 16	D.H.18 G-EARO(1h. 54m.)...	B. (3), D.H. 18(2), G.(4), H.P. (3), Sp. (3), V. (1).
Totals for week ...	38	82	11	30	26			

* Not including "private" flights. † Including certain journeys when stops were made *en route*.
‡ Including certain diverted journeys.

Av. = Avro. B. = Breguet. Br. = Bristol. Bt. = B.A.T. D.H.4 = De Havilland 4, D.H.9 (etc.).
F. = Fokker. Fa. = Farman F.50. G. = Goliath Farman. H.P. = Handley Page. M. = Martinsyde. N. = Nieuport.
P. = Potez. R. = Rumpler. Sa. = Saimson. Se. = S.E.5. Sp. = Spad. V. = Vickers Vimy. W. = Westland.

The following is a list of firms running services between London and Paris, Brussels, etc., etc.:—Co. des Grandes Expresses Aériennes; Handley Page Transport, Ltd.; Instone Air Line; Koninklijkie Luchtvaart Maatschappij; Messageries Aériennes; Syndicat National pour l'Étude des Transports Aériens; Co. Transaérienne.

R.A.F. Sports Board

THE Royal Air Force Recreational Council, which is responsible for the organisation and encouragement of all games in the Royal Air Force, has been re-organised, and will in future be known as the R.A.F. Sports Board.

The Board will consist of a chairman, secretary and treasurer, appointed by the Air Council from officers serving at the Air Ministry, and of the Air Officers Commanding the Inland and Coastal Areas, R.A.F. Cranwell and R.A.F. Halton or their representatives.

The Board will carry out its duties through the channel of the various Royal Air Force games associations. These associations, of which there are nine, are governed by bodies of voluntary officials, and are responsible to the Sports Board for the encouragement and organisation of the particular game they represent.

K.L.G. Aviation Plugs

A CASE of mistaken identity arose in the Accessory Section of last week's "Flight," in which the illustration representing the K.L.G. Aviation Plug really depicted a model G-1 (for motor car and motor cycle engines), and which, of course, is quite unsuitable for aero engines.

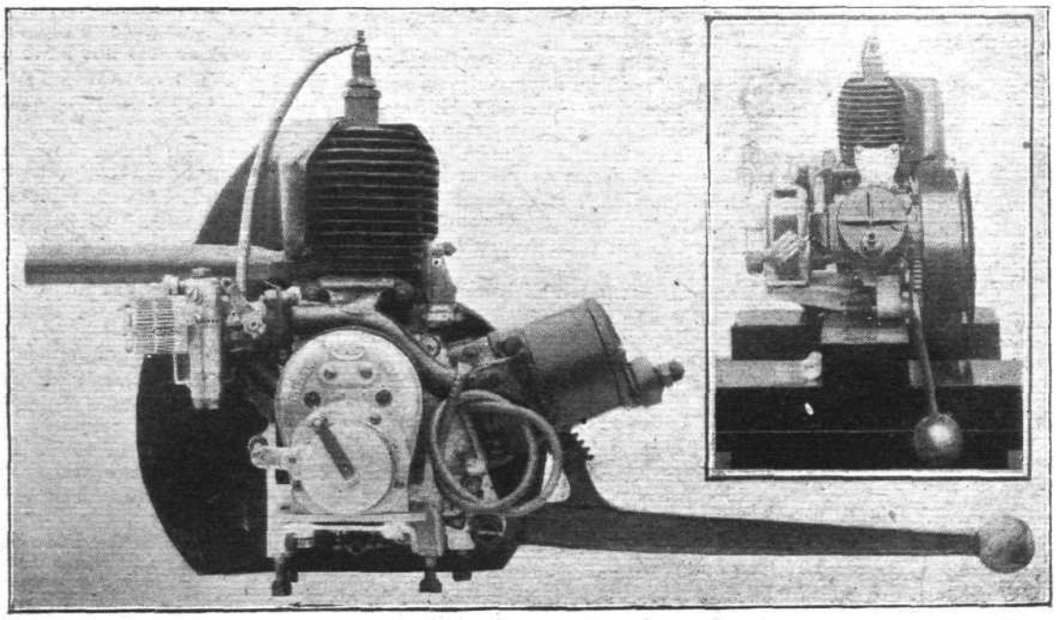
THE "BRISTOL" GAS STARTER FOR AERO ENGINES

A Successful Auxiliary Engine

IN view of the trouble and delay of starting up from cold an aircraft engine which has not been running for some time, it is somewhat surprising that not until now has there been on the market a really reliable, light and efficient engine-starter. As the power of aero engines increased, so the difficulty of starting became greater. Moreover, on modern large machines the engine and propeller are often placed so high in relation to the ground that even the objectionable practice of "prop.-swinging" becomes impossible. Even in modern times it is not an unusual sight to see men armed with a long rod or cane with a loop of rope on the end attempting to start an engine by hooking the loop over one blade of the propeller and, running along the ground, turn the engine over. We have personally watched such a performance at Croydon. On that occasion all the engine was wanted for was taxying the machine into its shed, it having just landed from Paris, and the engine was stopped while the passengers were being discharged.

Several attempts have been made at producing engine starters, some being designed to be fitted on the machine and others for use on the ground only. If a sufficiently light starter can be produced, there is no doubt that the former type is preferable. For instance, if a machine makes a forced landing in a field, it is unlikely that one of the "ground" starters will be available. Also, if, for any reason, an engine has been stopped in the air, only the former type of starter will be of any use for re-starting the engine in the air.

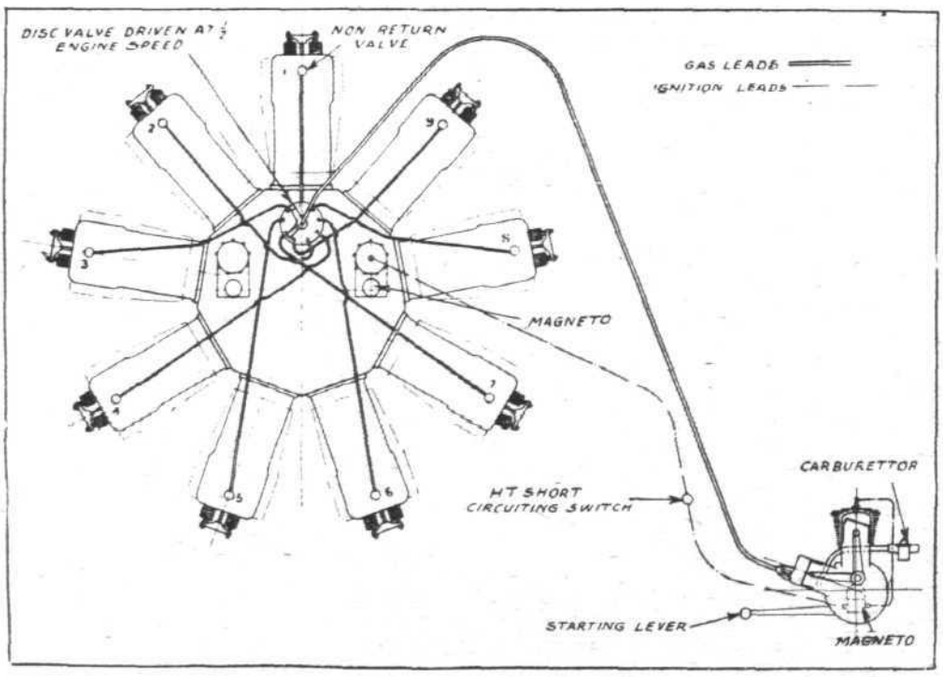
It now appears that at last a really satisfactory engine starter is available. The Bristol Aeroplane Co., Ltd., of Filton, Bristol, have just completed the tests of a new gas starter designed and manufactured by them, and designed originally specially for the Bristol "Jupiter" aero engine.



The New Bristol Engine Starter: The side view shows clearly the power and pumping cylinders and the starting handle, while in the end view can be seen the casing over the fan used for cooling.

The starter is, however, applicable to almost any other make of engine, and unless some unsuspected defect should develop, which there is no reason to expect, the new starter bids fair to do all that a starter can reasonably be expected to do. Here are some of the things the starter has already accomplished:—Started a "Jupiter" engine from cold in 17 seconds, and when hot it has been started repeatedly in 2-3 seconds. It has turned a 500 h.p. engine over, when cold, at 12 to 15 r.p.m. It has maintained a gas pressure of 140 lbs./sq. in.; and it weighs complete only 40 lbs.

The Bristol gas starter consists of a small two-stroke air-cooled, single-cylinder petrol engine, whose crank-case has mounted on it a pumping cylinder. The latter draws a combustible mixture from the carburettor, supplies the



Diagrammatic representation of the action of the new Bristol engine starter. Simple in action, and certainly not of excessive weight, the new starter should prove a boon on all commercial aeroplanes where the old-fashioned method of "prop.-swinging" is still in use. Most engines up to 500 h.p. can be started in from 15 to 20 seconds from cold.

power cylinder, and pumps the mixture under pressure to the main engine cylinders. Interposed between the pumping cylinder and the main engine cylinders is a small disc valve distributor, driven at half-engine speed from the main engine, which passes the compressed explosive mixture to the main engine cylinders in the proper sequence. The mixture is admitted on the firing stroke and also on part of the induction stroke, and in order to avoid loss of pressure through the open inlet valves on the induction stroke, the port in the distributor which is in communication at this period is controlled by a spring-loaded ball valve, arranged to open at a pressure of about 40 lbs., or some figure most suited to the particular engine to be started. A non-return valve is fitted to each cylinder, which effectively isolates the starting apparatus when the main engine is running.

The gas starter is fitted with a two-cylinder magneto (C.A.V.) from which one ignition lead is taken to the sparking plug of the two-stroke power cylinder, while a second is taken to the central terminal of the distributor on one of the main engine magnetos. When the two-stroke engine is started (by means of the starting handle shown in the illustrations) explosive mixture is supplied to the main engine cylinders under pressure, and the main engine begins to turn. At the same time gas is admitted into the cylinders during a period of the induction stroke, this gas being passed through the cylinders and open inlet valves and filling the induction system. After one complete revolution of the main engine, the whole induction system is filled with gas, which is drawn in on the next induction stroke. By opening the short-circuit switch between the starter magneto and the main engine magneto the engine will fire and pick up on its own carburettors. It will thus be seen that the gas starter supplies both gas and ignition to the main engine for starting.

In addition to its function as a starter, the auxiliary engine can be used for driving wireless generators, etc., as it can be run continuously without overheating.

As regards the engine itself, there is little to tell. The whole unit is very neat and simple, and one wonders why all these years have elapsed before such a simple and effective starter has been produced. Both the power and pumping pistons are of aluminium. The bore is 3 in. and the stroke 2½ in. The big ends of the connecting rods are mounted on roller bearings and are located side by side on one common crank-pin. The power cylinder, which is of cast iron, is of the three-port type, the crank-case being used to compress the mixture. The pumping cylinder, also of cast iron, draws its mixture through a port uncovered by the piston as it reaches the bottom of its stroke, and discharges through a non-return valve in the head. The crankshaft is in two parts, with integral balance weights, and is mounted on ball bearings. From one end the two-cylinder magneto is driven direct, while the fly-wheel and starting gear are carried on the other end.

The starting gear consists of a quadrant attached to the starting lever, which is brought into mesh with the pinion connected through a free-wheel to the fly-wheel. When not in use the quadrant is entirely out of mesh with the pinion. Unlike some starters which we could mention, the starting of this little engine takes a few seconds only, and not, as in some cases, as long as the average main engine.

A cast-iron fan fly-wheel is fitted, which furnishes a draught of air sufficient to prevent the power cylinder from overheating even when the engine is being run all out for long periods. The fly-wheel is also provided with a V-belt rim which may be used for driving auxiliaries. As already mentioned, the weight of the starter complete is only 40 lbs.

CAMBRIDGE UNIVERSITY AERONAUTICAL SOCIETY

(OFFICIAL ORGAN "FLIGHT")

THE MOORING OF AIRSHIPS*

By Major G. H. SCOTT, C.B.E., A.F.C.

IN his introductory remarks the author drew attention to the fact that this is the only country that has taken airship mooring seriously—probably because the weather in this country makes the operation of airships difficult without some form of mooring—and that as a result of the immense amount of labour and thought expended on this problem we are in a position to say that it is now a practical proposition He then gave a short history of airship mooring experiments.

"I will now discuss in greater detail the various types of mooring: (1) Mooring on the surface of land or water; (2) Mooring in the air on one or more wires, and towing; (3) Mooring at a mast.

"(1) *Mooring on the Surface of Water.*—First attempts were made in this country with Admiralty Airship 1, at Barrow. In this ship the cars were made to float, the airship was then made heavy, and floating on the water, was towed up to the mooring post. This consisted of a lattice work steel mast, stayed rigidly to a pontoon, which was secured to a concrete anchor pillar sunk in the bottom of the dock. The ship rode at this mooring in winds up to 36½ m.p.h., the chief trouble experienced being the difficulty of preventing the ship from yawing and causing the pontoon to swing about the anchor pillar. This demonstrated the necessity of fixing the point of rotation of mast head to pass through the mooring point of the ship.

"The next attempt was carried out at Barrow on an S.S. The system employed consisted of a mast rigged to a pontoon which swung round a pivot built up from the bottom of the dock. The ship never rode out bad winds and rolled badly in gusty winds, owing to the point of mooring attachment being below centre line of ship—big strains were thus set up and parts of ship carried away.

"(2) *Mooring Airships on the Ground.*—One of the first ideas to be carried out. Has been used on many occasions. . . . In the very early days very little shelter being considered necessary. During the War the submarine menace necessitated concentrating a large number of S.S. ships at certain points on the coast. Existing number of sheds was not sufficient, and the necessity of mooring this type of ship thus became vital, and at Mullion attempts were made to moor one of these ships in a clearing in the wood, with such satisfactory results that mooring-out stations were prepared all round the coast . . . the shed-stations became the mother station of three or more mooring bases, and the shed was used in its true rôle as a dock, to which ships came for repairs, or new ships were erected.

"It is sometimes difficult to find trees suitable for such arrangements. Experiments were therefore carried out at Pulham with the object of producing an airship in which the car could be detached, and the envelope bagged down on to the ground as with a kite balloon. Such a ship could be moored on leeward side of any ordinary plantation and special lanes cut through high trees thus unnecessary. In this ship additional rigging patches were fitted to the envelope to which bagging down ropes were attached, these taking the lift of the ship. The car was detached by quick-release slips, and all controls were similarly broken. . . . In order to bag right down on to the ground certain other modifications were necessary—to make the lower fin quickly detachable and to replace the metal blower by a fabric one. On the experimental ship, with a practised crew of eight men, it was possible to have the ship flying from the bagged down position in 14 minutes, and to bag down again within 10 minutes.

"*Mooring in the Air.*—The first attempt at this type was the Usborne system. Theoretically this system is ideal, but in practice it has one great drawback, a change in the direction of wind necessitates an alteration in the position of the side guys. This means keeping a number of men constantly on the watch for this duty. Some very successful tests were carried out with this system, No. 3 being moored out at Gomersham Park for several weeks. It was also used for coastal ships on several occasions.

"*Three-Wire System.*—This was first used on R.9 in 1917. This ship had landed at Howden, and owing to the wind could not enter the shed. She was held by the landing party, and to steady the bow, three wires were taken from the mooring point and attached to three bollards set in a triangle; the ship was then made light and let up until these wires were taut. The result was so successful it was decided to carry out a series of experiments on a larger scale. A three-wire mooring was prepared at Pulham on an 800 ft. base, and R.9 moored out on this for four days; she rode very steadily, but the mooring point was not sufficiently strong to bear the lateral loads produced in a gust, and several of the girders were carried away. R.26 was then chosen to complete these tests, the mooring point being strengthened. In the meanwhile a series of experiments were made with S.S.29, which

* Extract from Paper read on November 16, 1921.

although supplying useful data for the rigid mooring, demonstrated that this system of mooring was of very little use for small non-rigids, owing to their small lift, etc.

" R.26 remained on the mooring for 10 days, and was finally destroyed in a snow squall. It was decided that as an emergency mooring this system had great value and was fitted at all rigid airship stations. R.34 was moored on type (2) at Mineola (U.S.A.), she behaved well and rode steadily, and remained on the mooring for about four days during some very gusty weather. The disadvantages of this system are: difficulty of re-fueling and re-gassing, also changing crew and taking in supplies.

" *Single Wire Mooring.*—This consists in allowing a ship to ride on a single wire similar to a kite balloon. The experiments on this system with R.9 indicated great possibilities. The ship is flown down slowly to within 300-400 ft. of the water, to windward of the mooring buoy, and a sea anchor or drogue is then lowered into the water, and the ship allowed to drift astern past the buoy, a launch or tender in the meantime attaching the drogue to the buoy with a 600 ft. line. The drogue, containing some 2-3 tons of water, is too heavy for the ship to lift out, and the ship therefore rides up steadily, about 500 ft. up. Side surging is damped out by dragging the drogue through the water, the drogue moving on the arc of a circle, 500-600 ft. radius, with the buoy as centre. R.9 was thus moored for many hours, landing and leaving a large number of times with the sole assistance of a motor launch. In getting away, the drogue is slipped from the buoy and emptied by a special arrangement and drawn up into the ship. Re-fuelling and re-gassing are practically impossible, but experiments have been made of towing non-rigids, during which the ship has been re-fuelled, re-gassed, and the crew changed. We now come to the most important.

" *Mast Mooring.*—The first experiments were made at Farnborough in 1912 with the Beta, which rode very steadily in a wind of 35 m.p.h., but it was found that the wear on the fabric of the nose was rather excessive. The next experiments were made at Barrow (Messrs. Vickers) with three types—the first already described under ' Mooring on the Water ' ; the second was almost a repetition of the Farnborough ones, and suffered from the same trouble ; the third was designed to overcome this difficulty. In this the ship is moored between the arms of a fork, placed a short distance back from the nose, the larger diameter of the ship at this point enabling the shear forces to be taken. Kingsnorth Station devised another method to overcome nose trouble, by means of a stiff spar placed inside the envelope and attached at its after end to the envelope by radial wires, the mooring point being at the forward end. These experiments were not successful.

" In the experiments with rigids a steel lattice work mast 100 ft. high was erected at Pulham, fitted with a revolving head for securing the ship, and R.24 was fitted with a special attachment on the nose to engage with the mast, and her bow stiffened. R.24 was taken out of the shed and secured to the mast by hand, where she remained out for 21 days before being taken back to the shed. After work on small improvements found necessary, she was taken out again, and this time remained out for 42 days in all weathers—the highest wind experienced being 45 m.p.h. She behaved well, riding easily and remaining steady in the direction of the wind. Two men were on watch in the control car the whole time and one on the ground to fill up water ballast bags if she became light or to gas up if she became heavy. The gas and water mains enabled changes in buoyancy, however rapid, to be counteracted. She rode best at 0-4° down by nose, but the trim did not have nearly such a marked effect on the stability as in the 3-wire system.

" R.24 was then brought back to the shed for minor alterations for flying and landing tests, in which the following method was employed. A wire rope was led from a winch through the mast and socket (on revolving head) and laid out along the ground about 350 ft. to leeward. R.24 was flown to vicinity of mast with ordinary crew, and ballasted up about 300 lbs. light the end of the ship's wire (coiled on a drum inside the bows and led through the projecting ball) was lowered and shackled to the mast wire. The aft engine was then run astern and the ship hauled down to the mast until the ball on the nose entered the socket on mast. Time taken, 11 minutes ; number of men employed on gear, 7 ; wind, under 10 m.p.h. Further tests were made, but results not conclusive, the chief trouble being the tendency for ship to override the mast. In the summer of 1920 Pulham Station was handed over to the Controller-General of Civil Aviation and run as an experimental station to thoroughly test out the mooring mast. The old 100 ft. mast was used with a new pattern head made at Cardington, and R.33 (Capt. Thomas) employed, with stiffened bow and new mooring fitting. [The author proceeded to describe method employed in landing ship, similar, with modifications—yaw guys, etc.—to that previously described.] R.33 used the mast almost continuously until August, flying daily. In April R.36 was stationed at Pulham and also worked from the mast, and on one occasion seriously damaged her bow through the mast wire fouling the side guy winches. This accident showed that the 20 m. gas bag right forward in R.36 in place of two 10 m. bags as in R.33 was the cause of weakness in the frame. Also it showed the necessity for a properly designed winch. [Details of re-fuelling, re-gassing, etc., were then described by the author, who also touched on the matter of repairs while at the mast, and summarised the results of the mooring experiments thus] : It was proved that an airship could remain at a mooring mast, comfortably, in winds up to 60 m.p.h., riding through hail and snow squalls. That a ship could, with ease, leave a mast in a 40 m.p.h. wind. That it could land at a mast in winds up to 32 m.p.h. That moderate sized repairs could be made on a ship at the mast with safety. It was shown that the hull deterioration at a mast is not heavy, the outer cover and gas bags were not so satisfactory ; but results of tests made in Egypt indicate a cure for this trouble.

The author then discussed the advantages of the mooring mast, both from the military and civil points of view, laying particular stress on the value of the mooring mast commercially and stating that an airship working from a mast can be relied upon to leave regularly at scheduled time, and provided the weather is not too bad, it can land without danger, thus making a regular airship service possible.

THE ROYAL AIR FORCE

London Gazette, November 22

Permanent Commissions

Squdn. Ldr. P. R. Burchall, O.B.E., is placed on half-pay, Scale A, with effect from November 15, until further notice. Flying Offr. C. W. Attwood is placed on half-pay, Scale B ; October 29. Flying Offr. R. E. Keys, D.F.C., resigns his commn. ; November 8.

Short Service Commissions

Flying Offr. C. Roper relinquishes his commn. on account of ill-health, and is permitted to retain rank of Lieut. ; November 23.

Medical Branch

Flight Lieut. W. G. L. Wambeck is granted a short service commn. in the rank stated, retaining his present seny. ; November 28. The following are granted short service commns. as Flying Offrs., with effect from, and with seny. of November 7 :—E. C. K. H. Foreman, W. J. G. Walker.

Flying Branch

Sec. Lieut. J. T. I. Brownlee to be Lieut. ; June 14, 1918. Lieut. J. T. I. Brownlee relinquishes his temp. commn. on ceasing to be employed, and is permitted to retain his rank ; August 25, 1919 (substituted for *Gazette* March 9, 1920). The permission granted to Sec. Lieut. G. S. Cooper to retain his rank is withdrawn on his joining the Army.

Administrative Branch

Lieut. (acting Capt.) S. W. Hodgkinson relinquishes his temp. commn., and is permitted to retain rank of Capt. ; November 4.

Stores Branch

D. A. W. Sugden is granted a temp. commn. on probn. as a flying officer ; April 11 (substituted for *Gazette* May 3).

Medical Branch

J. Paxton is granted a temp. commn. as a Flight Lieut., with effect from, and with seny. of November 3.

London Gazette, November 25

Group Capt. D. Munro, C.I.E., M.B., F.R.C.S. (E.) is appointed Director of Medical Services, Air Ministry, *vice* Group Capt. (actg. Air Commodore) M. H. G. Fell, C.B., C.M.G., D.P.H., D.T.M. ; November 26.

General Duties Branch

The following are restored to the active list from half-pay, November 26 :—Flight-Lieut. G. H. Hall, A.F.C., Flying Offr. S. L. Quine, M.C.

Memoranda

Sec. Lieut. (Hon. Lieut.) C. A. Horn to be Lieut. (O.) ; June 7, 1918. The following Lieuts. relinquish their temp. commns. on ceasing to be employed, and are permitted to retain their ranks :—P. J. Moloney ; May 15, 1919 (substituted for *Gazette* November 15). G. V. Howard ; October 10, 1919 (since granted short service commn.).

Group Capt. (actg. Air Commodore) M. H. G. Fell, C.B., C.M.G., D.P.H., D.T.M. (Lieut.-Col., Bt.-Col., R.A.M.C.) relinquishes his temp. commn. on return to Army duty ; November 26.

FLIGHT

THE SECOND ANNUAL PULITZER RACE AT OMAHA

Won by Acosta on the Curtiss-Navy Racer

Six machines were entered for the second Pulitzer Race held at Omaha on November 3. These were :—

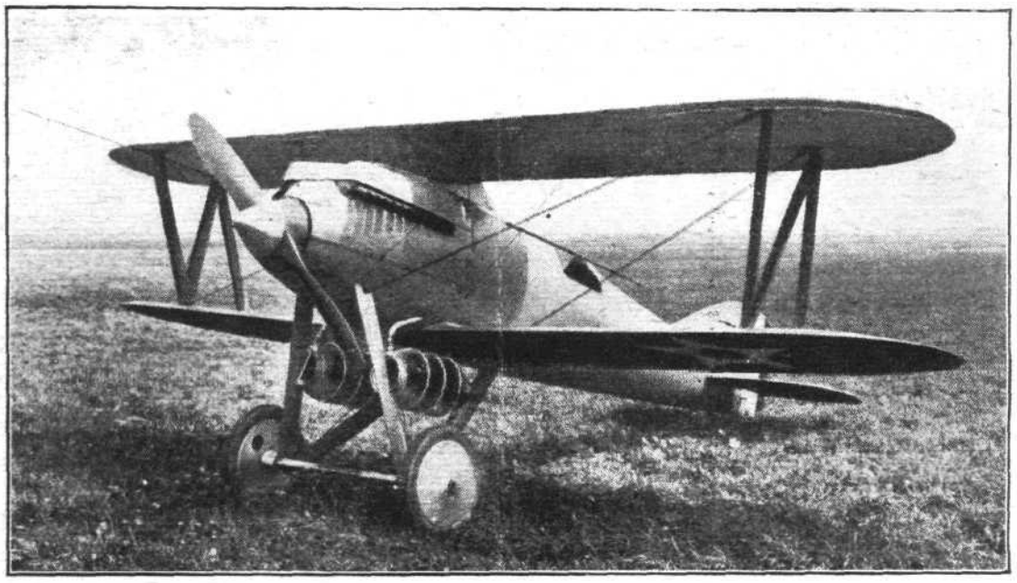
Make.	Engine.	Pilot.
Curtiss-Cox.. ..	435 Curtiss C.12 ..	Coombs.
Curtiss-Navy ..	400 Curtiss C.D.12	Acosta.
Ansaldo Balilla ..	400 Curtiss C.12 ..	Bertaud.
Thomas-Morse M.B.6	300 Wright ..	MacReady.
Thomas-Morse M.B.7	300 Wright ..	Hartney.
S.V.A. 9	225 S.P.A.	Curran.

The Curtiss-Navy was built for the Navy as a racer, with the Pulitzer Race in view. As the Government decided to withdraw from participation in the competition, the Navy Department lent the machine to the Curtiss Company, and she was flown to victory in the race by Bert Acosta. As the accompanying photograph (for which we are indebted to our New York contemporary *Aviation*) shows, the machine is a biplane, and looks somewhat like a cross between the racing Nieuports and the Gloucestershire "Mars I." The *fuselage* is of monocoque construction, with the pilot's cockpit placed well aft. There is a single pair of N-struts on each side, and the straight wings, which have a span of 22 ft. 8 ins., have their tips rounded off. Lamblin radiators are fitted between the chassis Vees. The length o.a. of the machine is 21 ft., and the weight empty is 1,735 lbs. The total weight is 2,165 lbs., giving a power loading of 5·24 lbs./h.p., and a wing loading of 12·5 lbs./sq. ft. The estimated high speed is 190 m.p.h., and the landing speed 70 m.p.h. The speed made in the race was 176·7 m.p.h., which is claimed as a world's record for a triangular course, the speed made by Kirsch in the Coupe Deutsch being 173 m.p.h.

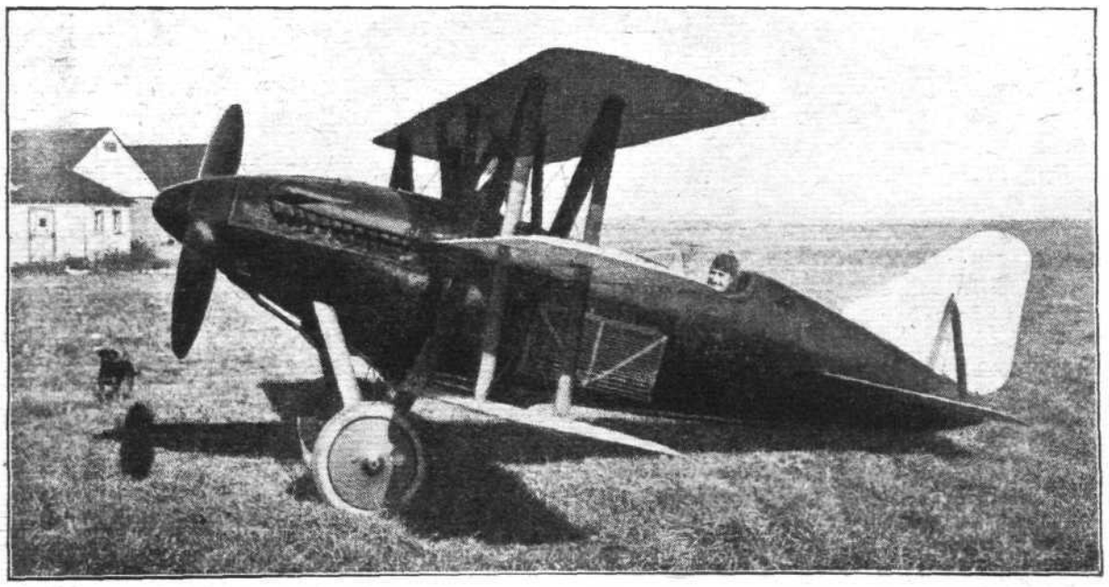
The Curtiss-Cox is the "Texas-Wildcat" machine of last year's Gordon-Bennett race, fitted with triplane wings. It was built by the Curtiss Company to the order of Mr. Cox of Texas, whose memory still lives at Etampes and surrounding country. In its new form, the machine has a span of 20 ft., a length of 19 ft. 3 ins., an area of 175 sq. ft., and a gross weight of 2,406 lbs. The wing loading is 13·75 lbs./sq. ft., and the power loading 5·53 lbs./h.p. The indicated speed at ground level is 196 m.p.h., landing speed 70 m.p.h.

Although actually the faster machine, the "Cactus Kitten" averaged 170·26 m.p.h. "only" in the race, owing probably to Clarence Coombs not taking his turns so sharply as did Acosta on the Curtiss-Navy racer. On the straight Coombs' machine appeared to gain.

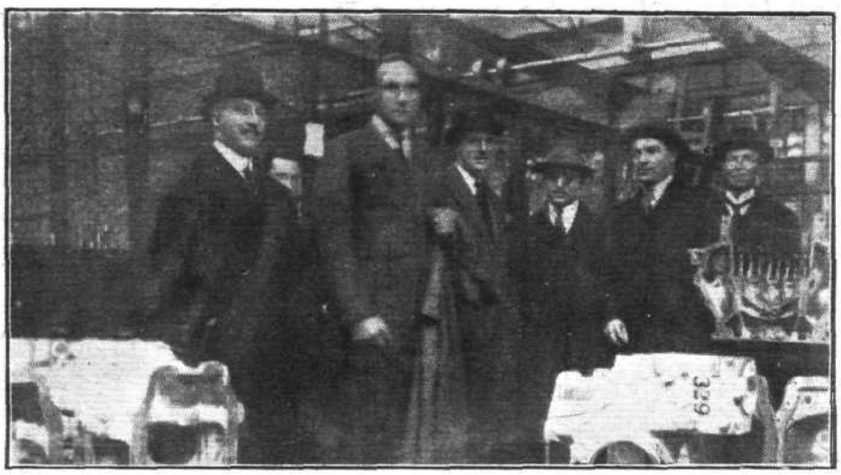
Colonel Hartney, who was flying a Thomas-Morse "M.B.7" semi-cantilever monoplane with 300 h.p. Wright-Hispano engine, had to make a forced landing, and was severely injured.



The winner of the Pulitzer Race: The Curtiss-Navy Racer flown by Bert Acosta.



The Curtiss-Cox ("Cactus Kitten") Racer on which Coombs finished second in the Pulitzer Race.



At the Napier Factory: H.R.H. The Spanish Infante Alphonso, cousin of the King, who has been practically interested in aviation for thirteen years, inspecting the great Napier Aero Engine Shop at the Acton Works the other day. Mr. H. T. Vane, C.B.E., is on the right of the "Infant."

CORRESPONDENCE

[The Editor does not hold himself responsible for opinions expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for insertion in these columns.]

BOMBING CIVILIANS

[2047] Field-Marshal Sir Henry Wilson wants the governors of the world to limit aeroplanes rather than submarines. The Americans at the Washington conference consider it impracticable to do so, on account of the alleged easy convertibility of civil aircraft to warlike purposes. Are the Americans right, and is the plea of the Chief of the General Staff quite hopeless? If that is the case, the outlook for civilians in the next war is gloomy indeed.

If we consider the simultaneous production of a martial and a commercial "D.H. 29," it appears that at the present moment the American view is correct. But things may be very different in a few years' time. In any case, it may be possible to limit the powers for evil of the bomber. We must remember that in the air it is the bomber which is the counterpart of the submarine, while the little fighter is the opposite number to the line-of-battle ship. From the point of view of a civilian population, the bomber is an offensive and the fighter a defensive aeroplane. It is not the aeroplane in general, but the bomber that Sir Henry Wilson wishes to see ruled out of court.

A commercial aeroplane converted to carry bombs ought to be very helpless when attacked by fighters. Therefore, the best guarantee against the use of such auxiliaries ought to be a large fleet of fighters, which in themselves cannot do much harm to open towns. If in the future a distinct specialised type of military bomber which will be capable of holding its own against fighters comes to be evolved, it ought to be quite possible for the governors of the world to limit the tonnage of such a type. This limitation would do no harm to the cause of aerial transport.

F. A. de V. ROBERTSON.

Hampstead, N.W. 3,
November 25, 1921.

Foreign Air Budgets

ITALY has increased her air budget for 1921-22 to 66 million lires, an advance of over 26 millions above the 1920-21 budget. In Siam, the Government Air Force is also augmenting her air force, as well as giving generous support to civilian and commercial flying.

In China, there appears to be a hitch over the finances of the healthy provision for commercial air services made by the Government as many times referred to. With normal Chinese methods the actual cash seems to be mainly missing, so that neither staff nor contractors are receiving their dues, which means that all the splendid missionary work already carried out by the Vickers Company, and those who have brought about the whole scheme, may be wasted. According to recent report to hand there are now at the Nan Yuan aerodrome 30 aeroplanes daily engaged in flying and 100 are as yet unpacked. All are of the latest type and finest workmanship. An able staff of foreign advisers and flying experts has been busying training the Chinese, many of whom have creditably passed their preliminary tests. China climatically and geographically is eminently adapted for flying, and opportunities for commercial aviation are very promising, but as already stated, all the fine spadework which has been done will be wasted and aviation will be set back for years if financial support is not forthcoming.

Fokker, Paris Aero Show and the "Joystick"

FOLLOWING the treatment of Mr. Fokker and his exhibit at the Paris Aero Salon, the report that M. Esnault-Pelterie has under an order of the French courts in connection with his "joystick" master patents claims, seized the Fokker machine, comes as a fitting climax. There is a good deal to be said on both sides, but at least Mr. Fokker's views are sufficiently emphasised by his refusal to be in any way intimidated or excluded from the Show.

AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations: cyl. = cylinder; I.C. = internal combustion; m. = motors
The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

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